

TECHNOLOGY DIVISION
THE SCIENCE NEWS-LETTER

A Weekly Summary of Current Science

EDITED BY WATSON DAVIS

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Vol. II, No. 100

Saturday, March 10, 1923

EXPLAINS HOW CLOUDS ARE DISPERSED BY SAND

How fogs are being removed and how rain will be caused to fall by electrically charged sand has been explained by Prof. Wilder D. Bancroft, of Cornell University, authority on colloid chemistry, who with L. Francis Warren has been conducting experiments at McCook Field, near Dayton, Ohio.

Fog Removal and Rain Making

By Dr. Wilder D. Bancroft,
Professor of Physical Chemistry,
Cornell University.

Clouds consist of drops of water too small to fall at appreciable rate. Drops are kept from coalescing either by being charged electrically and therefore repelling each other or by being covered with a film of condensed air acting like a gelatine capsule. Spraying with positively charged sand will cause negatively charged drops to coalesce and will also remove film of absorbed air to some extent. The first is the principle involved in precipitating electrically-charged colloids and the second occurs when the crystal detector is used in wireless. The large drops fall and carry down with them many of the finer drops just as the coarser particles of butter fat in milk carry up many of the finer ones when cream rises.

The new process invented by Mr. Warren sprays electrically charged sand from above and consequently gets more results for the same expenditure of power the thicker the cloud. Experiments at McCook Field show that with eighty pounds of sand charged nominally to fifteen thousand volts a cloud covering two square miles can be dissipated in less than ten minutes. Much better results are expected with sand charged to thirty thousand volts and more efficient charging nozzle.

Experiments so far have been made in cooperation with Army Air Service to demonstrate the feasibility of removing fogs from flying fields as aviators can neither go up nor come down safely in fogs. Experiments to be made at Moundville will use a captive balloon one thousand feet up to spray the sand and clear the field. Flying fields can certainly be kept clear and results look encouraging for clearing New York harbor when necessary. Successful preliminary experiments have been made with smokes; but nothing has been done with fogs containing smoke. The problem of removing London fogs seems much less visionary than it did one year ago and is now a question of efficiency.

The Army Air Service is interested in fogs, not rain, and no experiments on rain-making have yet been made. The clouds attacked so far have contained very little moisture. The problem of obtaining rain from heavy clouds should be much easier than dispersing fogs. No claim is now made that rain can be obtained from a clear sky. In many of the arid regions storm clouds pass over without raining. These can undoubtedly be made to rain. With a rain cloud one mile thick the necessary expenditure of power will be the same as with a cloud three hundred feet

thick but the amount of rain will be very much greater. The problem of rain-making and of fog dispersal consists in making small drops into large drops by coalescence and is not a problem of condensation. Since a cloud is an instable mass which should rain but does not, we are not dealing with gigantic forces of nature. The commercial success, if it comes, will be due to the fact that the development of the airplane has made it possible to attack clouds from above and to take advantage of the sweeping action of the falling drops. No one has ever considered rain-making as being colloid chemistry and not meteorology. One distinguished meteorologist pointed out in his book that it was very difficult to see how the drops in a cloud became large enough to fall; but he admitted that it does rain - which nobody can deny.

READING REFERENCE: Bancroft, Wilder Dwight. Applied colloid chemistry, general theory. New York, McGraw-Hill Book Co., 1921. The Case against rain-making.
Review of Reviews 65: 104-5, January, 1922. Cables to guide aircraft flying
in fog. Literary Digest, 73:71-3, April 22, 1922. Bell, C. H. Washing
London fog out of the atmosphere of a motion picture studio. Scientific American,
126:255, April, 1922.

HOW NATURE MAKES RAIN

The more dust there is in the air, the less chance there is of rain, but the popular idea that dust particles are necessary for rain formation is not altogether wrong, Dr. W. J. Humphreys, meteorological physicist of the U. S. Weather Bureau, said in commenting on the recent fog dispersing tests at McCook Field.

Rain occurs because many very small particles of moisture, that form the cloud or fog, are brought together to make big drops that have sufficient weight to fall to earth, Dr. Humphreys explained. In a cloud there is usually a superfluity of dust particles. Each little fog particle has one or more dust particles all its own.

Rain formation begins by rising moist air expanding and becoming cooler as it reaches the upper levels of the atmosphere. The first portion of the rising air forms a cloud by condensation of its moisture. Then when the ascending air hits this cloud, many of its dust particles are strained out by the lower layers of the cloud. And as it cools by further rising, the air that was warm can not hold all the moisture that it carries. More of it condenses out, and each newly formed droplet goes in search of something to cling to. Some of them find unsurrounded dust particles, but many more find the dust they covet already occupied by a droplet of water that is still light enough to fall very slowly. In fact, every particle that makes up a cloud is always slowly falling. When the new water joins with that already there, the combination becomes heavy and the drop of rain plunges downward to earth, often carrying with it other smaller drops. Below, the people say: "It is raining".

The scattering of plain dust or finely powdered material in the upper air to serve as nuclei for the raindrops was declared by Dr. Humphreys to be absolutely absurd in view of the way in which rain forms.

But the scattering of electrified sand for the dispelling of small strips of fog, such as has been done at McCook Field, he believed might prove of value in

military operations where expense is no consideration.

Any electrified object, he said, might attract to itself minute particles of moisture in a fog and carry them down with it. This clearing of the air would take place only in the area in which the sand or other electrified objects were falling. Such a method could not be carried out on a large enough scale to produce an appreciable amount of rain, he said.

READING REFERENCE: Humphreys, W. J. Physics of the air, pp 264-268. Philadelphia, J. B. Lippincott Co., 1920. Rain as a mystery. Current Opinion 72: 659, May, 1922.

VOLUME NUMBERS OF NEWS-LETTER

Vol. I of the Science News-Letter consisted of Numbers 50 to 90, inclusive.

Vol. II, now in progress, will consist of Numbers 91 to 116, inclusive.

Beginning with Vol. II, each volume will consist of 26 numbers issued during a half year. The numbering of issues will continue consecutively, however.

Volume numbers do not appear imprinted upon the News-Letter previously to this issue.

Dr. Edwin E. Slosson

CHATS ON SCIENCE

HOW WORDS LOSE REPUTATION

Language is a circulating medium, as money is, and words, like coins, are apt to lose their value in the course of time. A decline in the exchange rating of a word may be due either to inflation, that is, too promiscuous application, or to a growing popular suspicion of the soundness of its backing.

The Seven Wise Men of early Greece were called "sophists" as an honorific appellation. But later a "sophist" came to mean a man who pretended to know more than he did or, worse, who sold his wisdom to the highest bidder for the basest of purposes, that of making a wrong cause seem right.

Pythagoras repudiated the title of sophist, or wise man, because as he said, "none is wise save God". So he devised and assumed the more modest sounding term of "philosopher", a lover of wisdom. But this term has narrowed, if not degenerated. Philosophy, once the sum total of human knowledge, has come, in common parlance, to be confined to speculative metaphysics. When Plato said that states should be ruled by philosophers he did not mean by professors of metaphysics.

This degenerative process has gone so far that we have no word in good repute and common usage to apply to a group of competent and learned men. The word "scholars" would once have served, but this has fallen from its high estate and come to

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mean "pupils", that is, those who are being schooled, instead of those who have been schooled. To call a man a "sage" calls up in the average mind the picture of something grey and pedantic, if not green and aromatic. The word "scientist" has become so narrowed and lowered and misapplied that men of science hesitate to use it longer. The titles of "professor" and "expert" are also distinctly losing caste.

To call a man a "fellow" is not safe nowadays outside of the campus of a university.

It is hard to arrest a word when it is on the down grade and almost impossible for a word to regain a reputation once lost. It seems that some sort of gravitational force prevails in linguistics. The dictionary is crowded with words that once moved in the highest circles but now are outcast and marked "obs." or "vul."

The man who knows comes in the course of time to be considered a "knowing man", with the suspicion of knowing too much for his neighbors. The "kenning man" becomes the "cunning man". A master of arts gets the reputation of being "artful". A craftsman is regarded as "crafty". A politician has come to mean - well, a politician.

Four hundred years ago the word "virago" meant an heroic woman and was esteemed a fitting name to apply to Eve, the mother of all living. Nowadays no one would dare call a woman a virago to her face if she were one. "Hussy" has degenerated in a hundred years from a thrifty "housewife" to quite the opposite.

In Australian newspapers today you may see a lonely bachelor advertising for "a homely wife", not because he has an aversion to feminine beauty, but because he desires domesticity.

A "wretch" was not at all wretched on the start. Othello calls his beloved Desdemona, "Excellent wretch". A modern maiden would not feel complimented by such a term of endearment.

A "prude" was merely a prudent person.

A "villain" and a "boor" once meant simply a countryman, not necessarily wicked or even rude. A "knave" was a simple servant. A "varlet" was a candidate for knighthood. A "miscreant" meant one who differed from you in theology.

In 1548 it was proper to express the pious wish "that his son, Prince Edward, that good imp, may long reign over you". How is it that "imp" has since come to mean a little devil?

So, as we see, words generally degenerate as they grow old. That does not matter much, for we can always make new words so long as the alphabet holds out. I am not concerned over the loss of a name, but I am with the loss of the type that the name once signified. If an ancient and honorable title falls into disrepute it is not altogether without reason. It means that some at least of those who bore it have not lived up to its true meaning.

It would be a profitable exercise to consider such cases as occur to us of words that we see are gradually becoming lowered or limited and try to discover the cause of their decline and how it may be prevented.

READING REFERENCE: Greenough, James Bradstreet and George Lyman Kittredge. Words and their ways in English speech. New York, Macmillan Co., 1920.
Words, Oh how delicate they are. Atlantic Monthly, 130:858-9, December, 1922.
Profaned words. Atlantic Monthly, 130:568-70, October, 1922.

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ATTACK STREET LIGHTS AS GROSSLY INEFFICIENT

Ornamental street-lights now used in many American cities waste two thirds of their illumination upward into space, cause eye injuries, and make motor traffic more dangerous, it was asserted by members of the local branch of the Psychological Corporation at a meeting in Washington recently. Participating in the discussion were Dr. Raymond Dodge, chairman of the division of psychology of the National Research Council, Dr. Shepherd I. Franz, director of laboratories of the Government Hospital of the Insane, and Col. R. M. Yerkes, commanding officer of the division of psychology in the Office of the Surgeon General during the World War.

Methods were suggested by which at the same cost twice the present amount of light could be delivered to the sidewalk and roadway and traffic dangers decreased. Lighting for use rather than ornament was advocated.

Street light is useless unless it falls on terrestrial objects, it was pointed out. Light that radiates upward into space might make a pretty sight from Mars, if the inhabitants of that planet could see it, but it is useless for street illumination. Most of the light from the white street-lamp globes goes off into empty space or lights the fronts of buildings. Only about one-third serves to illuminate the sidewalks and streets.

At the same cost, it was declared, illumination of streets could be made twice as effective. Although full salvage of the lost light would be impossible without disfiguring or abandoning the present pretty white globes, something would be accomplished by placing a horizontal reflector on the bulbs. It would be still better, it was emphasized, to replace the globes by scientifically designed reflectors, which would form a hood over the lamp and concentrate the light downward where it is of use.

Instead of seeing a lot of pretty lamps as one looked down the street, cats, dogs, and people, automobiles and the road would stand out strongly. The difference would be much the same as the difference in the appearance to a driver of the road when illuminated by his own head lights as compared with the way it looks under the illumination of an oncoming automobile.

The glare of the bright spots of light, such as that made by the white globe lamps, decreases the visibility of nearby objects. This is exemplified in the familiar, and sometimes disastrous effect of oncoming automobile headlights.

Lights, provided with reflectors to direct the illumination toward the earth and shield the eyes of motorists and pedestrians from glare, should be numerous enough to prevent deep shadows and avoid the flicker caused by sharp alternations between light and dark. Nature has provided the eye with a compensating mechanism by which it may adapt itself to partial darkness and still see very well. But this mechanism acts slowly and rapid alternations of dark and light is trying on the eyes and disturbs vision whether in the movies or on the street.

"Street lighting must be based on common sense", it was declared, "but no good common sense ignores scientific facts. Modern street illumination makes a pretty effect, but it is inefficient in these days of congested fast traffic and high taxes. It would pay any city to have its lighting arrangements planned by a specialist, an illuminating engineer in consultation with artists and the local lighting companies."

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READING REFERENCE: Luckiesh, M. Artificial lighting, its influence upon civilization. New York, The Century Co., 1920. Luckiesh, M. Recent advances in lighting. Scientific American, 126:27, January, 1922. Moulton, R. H. Evolution of artificial lighting. House Beautiful, 51:600-1, June, 1922. Millar, Preston S. Recent developments in the art of illumination. Smithsonian Institution, annual report for 1914. Washington, 1915. Halvorsen, C.A.B. Development of Detroit's street lighting system. American City, 27:507-8, December, 1922.

NEW ELEMENT ISOLATED MAY AID GAS MANTLES

Gas mantles may be improved through the discovery of a new chemical element, hafnium, associated with the rare earths which are now used for that purpose, according to the opinion of scientists. It was isolated by Dr. Alexander Scott, director of scientific research of the British Museum. Two Danish scientists, Coster and Hevesey, recently reported the discovery of the new element through X-ray spectroscopy, and Dr. Scott identified a "new oxide" he had isolated as the new element.

Naming the new member of the chemical family has caused the differences of opinion common when new members of other families are to be named. Dr. Scott isolated the substance from a mixture of magnetic iron ore and titanium oxide from New Zealand in 1913. He has now suggested that, as this was allied to titanium which was named after Titania, queen of the fairies, it should be called Oberonium after Oberon, her consort. As a second choice he suggested Oceanium, from Oceania of which New Zealand is a part.

But the Danes decided that the name of the little stranger shall be Hafnium, after Hafnia, Danish for Copenhagen where their work was done.

The new element has not yet been isolated except in combination as an oxide. It appears to have an atomic weight of about 180 and is chemically allied both to the rare earths of the thorium group, and to titanium and zirconium. Oxides of these elements are used in gas mantles and it is thought that the oxide of the new element may be so used. Hafnium was one of the six elements whose existence had been predicted by chemists but which had not yet been isolated. It occupies the position of 72 in Moseley's list of elements.

READING REFERENCE: Rutherford, Sir Ernest. The constitution of matter and the evolution of the elements. Smithsonian Institution, annual report, 1915, Washington.

Colored objects fade about six times as fast in diffused daylight and between twenty and seventy times as fast in direct sunlight as they do under electric light.

Only three feet under the surface of the ground it is as cool at midday as at midnight.

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JANUARY 1, 1900

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TO THE HONORABLE
MEMBERS OF THE HOUSE OF REPRESENTATIVES
AND THE SENATE
AND TO THE PUBLIC

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ARMY DENTIST DISCOVERS GERMS CAUSING TEETH DECAY

Bacteria capable of causing tooth decay or dental caries have been discovered and isolated at the U. S. Army Medical School, Washington, by Dr. F. E. Rodriguez, captain, dental corps, U. S. Army.

This accomplishment is declared to be the greatest step toward getting at the real bacterium of dental caries that has been taken in the last three decades since the American dentist, Miller, established the assumption of the German bacteriologist, Koch, that tooth decay is caused in some way by bacteria.

Dr. Rodriguez told today in an exclusive Science Service interview how he isolated three types of bacteria with an exceedingly high acid-producing power, capable of dissolving the hard lime of the tooth and migrating into the deep tissue. He subjected teeth to pure cultures of these organisms and these teeth developed spots similar in all respects to the usual decay of teeth. Through accurate microscopic work he demonstrated that these same bacteria penetrate into the deep layers of the teeth, and he found these particular types of bacteria far beneath the softened, discolored, decayed portion.

"Dental decay is essentially a disease of youth and nine-tenths of our school children are afflicted", said Dr. Rodriguez, in discussing the seriousness of the dental decay problem. "The effects of dental decay are permanent throughout life."

In addition to experimenting with the tooth decay bacteria, Dr. Rodriguez placed teeth in pure cultures of other bacteria of the mouth and found that these were unable to produce decayed areas.

The three forms of tooth decay bacteria are different morphologically, he found, but their physiological activities appear to be similar. Dr. Rodriguez believes that it may be that only one is the real aggressor. The name of *Lactobacillus odontolyticus*, types 1, 2, and 3, has been given to these germs. The mouth condition under which these troublesome bacteria operate does not need to be as acid for these germs can concentrate the acid they produce in restricted spots on the teeth and cause the destruction.

"Modern civilized diet is, no doubt, a contributing factor of dental decay as it leaves much starch and sugar in the mouth capable of being fermented by the bacteria," said Dr. Rodriguez. "Modern diet lacks savory and acid constituents sufficient to stimulate a copious flow of saliva of the proper character. But the bacteria are the real cause and their growth is favored by the mouth conditions of modern civilized peoples."

"Tooth decay or dental caries is one of the most common of human diseases which has so far evaded inquiry as to its specific exciting cause," Dr. Rodriguez explained. "Since the time of Koch, it has been assumed that tooth decay was caused in some way by bacteria. Dr. W. D. Miller, an American who became a professor in the University of Berlin, worked with Koch and by a series of brilliant researches firmly established what is known as the chemico-bacterial theory of the cause of decay. In short, this hypothesis is that bacteria, of which there are an immense number of species in the mouth, through their life processes ferment acids on the tooth surfaces from starch and sugar food left in the mouth. The acid decalcifies or dissolves the hard ingredients of the teeth, opening passage-ways into the deeper parts of the teeth through which the bacteria pass and finally cause a dissolution of the hard parts of the teeth. Miller demonstrated bacteria

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in the fine channels in the dental tissues. Miller was unable, however, to isolate the specific bacterium which was the real aggressor and initial destroyer of the dental tissue. Since Miller's work, 1880 to 1890, it has been assumed that many species of mouth bacteria which were capable of elaborating acid caused decay."

Dr. Rodriguez said that further work in identification of the newly discovered bacteria will be carried on and that great possibilities for caries control exist when several suggestive factors that this investigation has developed are finally worked out.

Concurrently with the work at the Army Medical School on the bacteriology of dental caries, similar work by a group of British scientists was carried on in the Bland-Sutton Institute of Pathology in London. This work has been reported by Dr. James McIntosh and co-workers in the British press. Identical results were obtained in some respects and similar conclusions arrived at.

READING REFERENCE- Crocker, A. A. Modern dentistry for the laity. Cincinnati, O. Dental register, 1922, 4th ed. Gregory, W. K. Origin and evolution of the human dentition. Baltimore, Md. Williams and Wilkins. 1922.

Rodriguez, F. E. Studies in the Specific Bacteriology of Dental Caries. The Military Dental Journal. 5:199-220, Dec. 1922. McIntosh, J., W. W. James and P. Lazarus-Barlow. Bacterial origin of dental caries; Lancet 1:1183-1185, June 17, 1922; Investigation into etiology of dental caries; nature of the destructive agent and production of artificial caries. British Journal of Experimental Pathology 3:138-145, June 1922. (illus.) McCollum, E. V., N. Simmond, E. M. Kinney, and C. J. Grieves, Relation of nutrition to development and tooth preservation; preliminary study of gross maxillary and dental defects in 200 rats of deficient and defective diet. Bulletin of Johns Hopkins Hospital 33:202-215. June, 1922. (illus.). McCollum, E. V. The newer knowledge of nutrition. Macmillan Co., New York, 1919.

REAL LIFE MORE DEADLY THAN MOVIE

Truth is as thrilling as fiction, even of the movie variety, according to the experience of the U. S. Department of Agriculture which in spite of state cooperation is finding determined local opposition to its program of elimination of cattle ticks in some parts of the southern states.

The Department recently got out an educational film called "Mollie of the Pine Grove Vat", showing the advantages of cattle dipping and the dangers its agents sometimes face. The hero in the film is shot and badly wounded by enemies of the cattle dipping program.

And now comes the news that Max Lochridge, one of the Department agents, was shot dead while in the performance of his duty in Echols county, Georgia, on Feb. 3, proving that the movie plot was really conservative. Secretary of Agriculture Wallace has written a letter to the Attorney General, emphasizing the need of the prompt punishment of the murderer who is said to be known.

READING REFERENCE- U. S. Department of Agriculture. Bureau of Animal Industry. A tick-free South. Washington. Government Printing Office, 1917.

NEWS OF THE STARS

By Isabel M. Lewis
of U.S. Naval Observatory

GIGANTIC PIN WHEELS WHIRL IN HEAVENS

Spiral nebulae, those mysterious objects in the sky about which astronomers have engaged in excited controversy for many years, are gigantic "pin wheels" according to the recent researches of Dr. Adriaan Van Maanen at the Mt. Wilson Observatory of the Carnegie Institution. He has observed motion in them similar to that of the familiar decoration of Fourth of July nights, a throwing off of incandescent material from the center outwards in long spirals at a velocity of several hundred miles per second.

As a result of the measurements of the speed at which this material is thrown off, Dr. Van Maanen has derived some conclusions as to the size and distance of these glowing clouds of the starry sky. Some astronomers think they are complete universes at such a vast distance from ours as to appear to the unaided eye merely as points of light. Dr. Van Maanen believes he has disproved this theory and shown that the nebulae are not so far away nor so large as many have supposed.

They are probably only from 3,000 to 30,000 "light years" distant and from 10 to 300 "light years" in diameter, he asserts. To astronomers these are moderate dimensions as the diameter of our whole universe has been placed at from 30,000 to 300,000 of these units. But to a layman the distances are incomprehensible. A "light year" is the distance light, which travels 186,000 miles in a second, will traverse in a year and amounts to a little less than six million million miles. And at the nearest, these nebulae are 3,000 light years distant.

The method Dr. Van Maanen used was to compare accurate photographs recently taken of the nebulae with those taken a decade or more ago and then to measure the distance certain bright spots had moved. Evidence for the "pin wheel" type of motion was clearly shown. Measurements of distance were then made and as a result the observer declares these objects, which are chemically composed of gaseous material heated to incandescence interspersed with stars, are not distant views of independent "island universes" in the abyss of space.

According to the island universe theory the spiral nebulae are enormous systems of stars and nebulosity intermingled, similar in size and form to our own milky way but at distances of hundreds of thousands or even millions of light years from it and from our solar system which lies in the milky way. At a most conservative estimate the diameter of the milky way is approximately thirty thousand light years, - according to some astronomers it is ten times as great - so it is evident that the distances and dimensions for the spiral nebulae required by the island universe theory cannot be reconciled with the results of Dr. Van Maanen's investigations.

That no spirals are known to exist in or near the milky way, that they tend to gather in greatest numbers near its poles and also that they are in general receding from the milky way at high velocities are some of the points that have been quoted in favor of the island universe theory. They do not furnish any insurmountable objections to the belief that the spirals are nearer, smaller objects which at most can be only the progenitors of local groups or clusters of stars such as the Hyades or Ursa Major cluster, instead of far distant galaxies. The peculiarities

of the spirals, however, that led to the belief that they were island universes still make the origin and nature of these objects an unsolved mystery.

READING REFERENCE- Curtis, Heber D. Modern theories of the spiral nebulae. Smithsonian Institution annual report 1919. Washington, 1921. J. Arthur Thomson, Outline of Science, New York, E. P. Putnam Co. 1922.

TABLOID BOOK REVIEWS

INSECTICIDES AND FUNGICIDES, Spraying and Dusting Equipment. By O. G. Anderson and F. C. Roth. New York, John Wiley & Sons, Inc. 1923.

This is a chemical warfare training manual for the scientific agriculturalist. Written by Purdue University professors, it details the many poisons, fungicides, and sprays used in combating insects and plant pests.

PLASTICS AND MOLDED ELECTRICAL INSULATION, By Emile Hemming, Chemical Catalog Company. New York.

This is the latest, first and only book that brings together and up-to-date the rapidly increasing body of knowledge on the new materials used for insulation in electrical apparatus. It contains descriptions of various sorts of synthetic resins such as Bakelite, Condensite and Redmanol, as well as casein, cements, ceramics and artificial stones with very full references to patents and details of manufacturing methods. The varied uses of these materials is not generally appreciated. For instance, skim milk and formaldehyde gives a hard substance that replaces ivory for piano keys, buttons and brush-backs.

Various low marine organisms can not grow in synthetic sea-water unless a small quantity of natural sea-water is added.

In the last ten years, the daily per capita consumption of milk in this country has increased from six-tenths to seven-tenths of a pint, statistics from 356 cities show.

British scientists are experimenting with a trailing thermometer for use by fishermen to discover where in the sea to find hake, a fish said to be guided in its movements by the temperature of the water.

In Oregon alone is found one-fifth of the standing timber in the United States.

Attendants in leprosariums practically never develop leprosy.

In Dutch weekly periodicals, it is customary to cartoon scientific and professional men in the public eye with prominence equally to those in political life.

The fondness of the termites or "white ants" for feeding on books is said to be in part responsible for the slow cultural growth of many tropical countries.
